

REMARKS

Applicants have cancelled claims 29-31 and amended claim 32 to appear in independent form; as a result claim 32, when it issues, will not have been amended to bring it into compliance with any statutory requirement for patentability, and the full scope of equivalents will be available to claim 32 without prosecution history estoppel. Claims 33-35 have been amended to depend from claim 32. Applicants have also amended claim 36 to reflect the invention as disclosed and added claim 59 to round out the coverage.

Applicants thank the Examiner for allowing claims 5-15, 26, 27, 41-55, 57 and 58.

The disclosure of the specification has been objected to because an incorrect reference numeral is cited in paragraph [0247]. This objection is overcome because the paragraph as amended includes the correct reference numeral.

Claims 16 and 28 have been rejected under 35 USC 102(b) as anticipated by PCT International Publication No. WO 99/27532 (Lee). This rejection is respectfully traversed.

The solid immersion mirror device of claim 16 includes the feature that light entering the light-permeable medium of the device passes through the second reflecting surface located at the upper portion of the medium. This feature is described in paragraphs [0129] -[0149] with reference to Figs. 12-17. The second reflecting surface has "the property of transmitting the light 7 from outside and reflecting the light reflected from the lower surface 230." See page 24, lines 3-5 of the specification. Accordingly, the entire upper surface of the medium is used to focus light effectively onto the focusing point. The specification describes structures embodying this feature, including multi-layer dielectric film coating that has an incident-angle dependent transmittance (Fig. 13), a $\lambda/4$ plate placed on the top surface of the medium coupled with a use of

polarized light (Fig. 14) and a $\lambda/4$ plate placed inside the medium coupled with a use of polarized light (Fig. 17).

The Examiner contends that top surface 203 of Lee's light-permeable medium 20 is the second reflecting surface of claim 16. However, Lee's top surface 203 only reflects light and does not transmit light. Lee states "the first and second surfaces 203 and 205 have total reflection characteristics" at page 7, lines 30-31, and also states "the refractive surface 201 and the beam focusing surface 204 are not processed by a reflection coating, and have a light transmission characteristic" at page 8, lines 1-2. Accordingly, in Lee's device light passes through the refractive top surface 201, is reflected by the bottom surface 205, and is reflected by the top surface 203. Lee's device does not include the second reflecting surface of claim 16 that allows light to pass through and at the same time reflects light. Furthermore, Lee does not describe any structure that enables this feature, such as those described in the specification including the multi-layer dielectric film coating that has an incident-angle dependent transmittance and the use of a $\lambda/4$ plate and polarized light.

Accordingly, Lee does not teach or suggest the second reflecting surface of claim 16. Claim 28 also includes the second reflecting surface of claim 16. Thus, the rejection of claims 16 and 28 under 35 USC 102(b) on Lee should be withdrawn.

Claims 29-31 and 37 have been rejected under 35 USC 102(e) as anticipated by U.S. Patent No. 6,185,051 (Chen). This rejection is respectfully traversed.

The rejection of claims 29-31 is moot in light of the cancellation of these claims.

The solid immersion mirror device of claim 37 includes a light incident point positioned on a boundary of an upper portion of the light-permeable medium. This feature is described in paragraphs [0217]-[0231] with reference to Figs. 32-24. The light incident point 225 of claim 37

is located at the upper boundary of light-permeable medium 210. Light is led to this light incident point through optical fiber 22, reflected by side reflecting surface 240, and focused onto light focusing point 235.

The Examiner contends that the focusing device 700 of Chen is the solid immersion mirror device of claim 37. However, Chen's device 700 does not have the light incident point on the boundary of the upper portion of the light-permeable medium. Though Chen's device 700 uses a divergent laser beam 135 as the Examiner points out, the light incident point of the divergent laser beam is placed outside the device 700 and is not located at the boundary of the upper portion of the light-permeable medium. Accordingly, Chen's device requires a much longer optical path than that of the device of claim 37.

Chen does not teach or suggest the light incident point of claim 37. Thus, the rejection of claims 29-31 and 37 should be withdrawn.

Claims 1-4 and 17-25 have been rejected under 35 USC 103(a) as unpatentable over Lee in view of U.S. Patent No. 5,638,219 (Medina Puerta). This rejection is respectfully traversed.

The solid immersion mirror device of claim 1 includes a first reflecting surface which is part of a curved surface produced by rotating a parabola about its axis of symmetry and a second reflecting surface which is part of a plane perpendicular to a line connecting the focus and the vertex of the parabola. Because of this positioning of the flat second reflecting surface with respect to the revolved parabola of the first reflecting surface, light incident on this device is focused onto a light focusing point. This feature is described in paragraphs [0089]-[0099] with reference to Figs. 3-5.

Lee does not describe any surface of the light-permeable medium that is formed by rotating a parabola. The only description of the surface shape that Lee provides is that those

surfaces are curved or convex toward light source. See, for example, page 12, lines 2-7. Medina Puerta does not describe such a parabola-revolved surface either. Medina Puerta only states that some of the surfaces are aspherical conical revolving surface. See, for example, column 3, lines 23-37. Accordingly, Lee and Medina Puerta do not describe the first reflecting surface of claim 1, much less the positional configuration of the second reflecting surface with respect to the first reflecting surface. Accordingly, Lee and Medina Puerta do not teach or suggest the solid immersion mirror device of claim 1 as a whole.

The Examiner also contends that it would have been obvious for persons skilled in the art to combine Lee and Medina Puerta. Applicants respectfully disagree with the Examiner.

The Examiner admits that Lee does not describe the parabola-revolved first reflecting surface of claim 1 and the flat second reflecting surface of claim 1. To try to overcome this deficit, the Examiner relies on Medina Puerta. However, Medina Puerta's device is directed to an image magnifying optical systems such as eyepieces, microscopes, telescopes, binoculars, large telescopes and photographic cameras. See, for example, column 1, lines 57-62. In other words, Medina Puerta relies on conventional optics. On the other hand, the solid immersion mirror device of claim 1 relies on near field optics using the solid immersion mirror device with a light focusing point provided on its light exiting surface. Without a suggestion that Medina Puerta's conventional image magnifying device may be used as a solid immersion mirror device of near field optics, persons of ordinary skill in the art would not have been motivated to combine the two references cited by the Examiner. Replacing a conventional optical system with a near field optical system is not a matter of obvious design choice, contrary to the Examiner's contention, and there is no evidence to show that it is. Applicants respectfully request that the Examiner either provide evidence to support his contention or withdraw it.

Claims 2-4 depend from claim 1, and claims 17-24 depend from claim 16, which are patentable over the cited references as explained above. Claim 25 includes the first reflecting surface and the second reflecting surface of claim 1. Thus, these claims are patentable over the cited prior art.

Applicants further point out to the Examiner that the rejection of the dependent claims is not supported by evidence. In rejecting claims 19-22, the Examiner contends that the coating for selectively transmitting light of claim 19, the polarization component of claim 22 and the configuration of the second reflecting surface of claims 20 and 21 are well known and that it would have been obvious to modify Lee's device to include these features. As explained above with respect to the rejection of claim 16, the light transmitting feature of the second reflecting surface of claim 16 is achieved by applying the claimed light manipulating measures, such as the $\lambda/4$ plate and the multi-layer dielectric film coating with the incident-angle dependent transmittance to the solid immersion mirror device. None of the cited references describes such light manipulating measures, nor provides evidence to support the contention that such modification of Lee's device would have been obvious.

Accordingly, the rejection of claims 1-4 and 17-25 should be withdrawn.

Claims 32-35 and 38-40 have been rejected under 35 USC 103(a) as unpatentable over Chen. This rejection is respectfully traversed.

Claim 32 as amended to appear in independent form includes the feature that the light-permeable medium has a refractive index of not less than $1/\sin\theta$ wherein θ is the minimum angle of incidence on the side reflecting surface. Because of this feature, the light incident on the side reflecting surface is totally reflected. See paragraph [0178] of the specification.

The Examiner admits that the feature of claim 32 of making the refractive index less than $1/\sin\theta$ is not taught or suggested by Chen, but contends that this feature is useful in preventing stray light from adversely affecting the device performance and thus it would have been obvious to include this feature in Chen's device. Applicants point out to the Examiner that this feature of claim 32 has nothing to do with preventing stray light. Accordingly, the Examiner's contention is not supported by any evidence. Applicants request that the Examiner provide evidence, first, to support the contention that making the refractive index less than $1/\sin\theta$ is known in the art and, second, to support the contention that including such feature in Chen's device would have been obvious. Chen does not teach or suggest the solid immersion mirror device of claim 32 as a whole.

Claims 33-35 as amended depend from claim 32. Claims 38-40 depend from claim 37, which is patentable over the cited reference as explained above. Accordingly, the rejection of claims 32-35 and 38-40 should be withdrawn.

Claims 36 and 56 have been rejected under 35 USC 103(a) as unpatentable over Chen and Lee. This rejection is respectfully traversed.

Claim 36 as amended includes the same feature as claim 32, which is patentable over Chen as described above. Claim 56 includes the same feature as claim 37, which is patentable over Chen as described above. Lee does not supplement Chen for the teaching of the features of claims 32 or 37. Accordingly, Chen and Lee do not teach or suggest the devices of claims 36 and 56 as a whole. Thus, the rejection of claims 36 and 56 should be withdrawn.

New claim 59 depends from claim 32 and recites the feature of cancelled claim 30.

In light of the above, a Notice of Allowance is solicited.

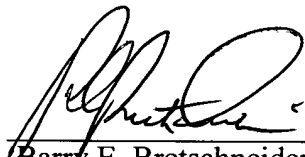
Attached hereto is a marked-up version of the changes made to the specification and claims by this amendment, captioned "Version marked to show changes made".

In the event that the transmittal letter is separated from this document and the Patent and Trademark Office determines that an extension and/or other relief is required, applicants petition for any required relief including extensions of time and authorize the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to Deposit Account No. 03-1952, referencing Docket No. 325772026300.

Respectfully submitted,

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VERSION MARKED TO SHOW CHANGES MADE

In the Specification:

Correct paragraph [0247] on page 50 to read as follows:

With reference to Fig. 38, assuming that the divergent light 7D is emitted from the focus 825c of a parabola 850 and reflected from the parabola 850, the reflected light becomes collimated light 71. Conversely, when collimated light parallel to a symmetry axis [801a] 811a is incident on the parabola 850, the light is focused onto the focus 825c.

In the Claims:

Amend claims 32-36 as follows:

32. (Amended) [The] A solid immersion mirror device [according to claim 31,] comprising a light-permeable medium having a refractive index greater than 1, said solid immersion mirror device comprising:

an upper surface formed in an upper portion of said medium; and

a side reflecting surface of a substantially tubular shape extending from said upper portion to a lower portion of said medium, the side reflecting surface being a part of a curved surface produced by rotating a parabola about a symmetry axis thereof,

wherein collimated light entering said medium along the symmetry axis of the parabola by way of said upper surface in a direction from said upper portion to said lower portion is reflected once from said reflecting surface while propagating in said medium, and is then focused to a focus of the parabola on a boundary of said lower portion, and

wherein said medium has a refractive index of not less than $1/\sin\theta$ wherein θ is a minimum incident angle on said reflecting surface.

33. (Amended) The solid immersion mirror device according to claim [29]32, further comprising a component for intercepting light in a central region of said upper surface.

34. (Amended) The solid immersion mirror device according to claim [29]32, further comprising a component for converting light in the form of a light beam of a circular sectional shape into in the form of a light beam of a ring-shaped sectional shape.

35. (Amended) The solid immersion mirror device according to claim [29]32, wherein a surface of said medium is provided with a mask near said [light focusing point] focus of the parabola, and said mask has a minute opening formed at said [light focusing point] focus of the parabola.

36. (Amended) A reproducing apparatus for reading information recorded on a recording medium, said reproducing apparatus comprising:

a light source;

a solid immersion mirror device [made principally of] comprising a light-permeable medium having a refractive index [of] greater than 1,

said solid immersion mirror device including

an upper surface formed in an upper portion of said medium, and

a side reflecting surface of a substantially tubular shape extending from said upper portion to a lower portion of said medium, the side reflecting surface being a part of a curved surface produced by rotating a parabola about a symmetry axis thereof,

wherein collimated light entering said medium along the symmetry axis of the parabola by way of said upper surface in a direction from said upper portion to said lower portion is reflected once from said reflecting surface while propagating in said medium, and is

then focused to a [light focusing point] focus of the parabola on a boundary of said lower portion, and

wherein said medium has a refractive index of not less than $1/\sin\theta$ wherein θ is a minimum incident angle on said reflecting surface;

an optical system for directing light emitted from said light source to said solid immersion mirror device;

a scanning mechanism for scanning said solid immersion mirror device along a recording surface of said recording medium, with said light focusing point of said immersion mirror device opposed to said recording surface; and

a detector for detecting light from said recording surface.